LBNL Electrical Safety Self-Assessment
March 2005

Purpose of the Assessment

- **In conjunction with the program review conducted by the Electrical Safety Committee, establish a performance baseline for the electrical safety program.**
- **Ensure our readiness for the DOE SC Electrical Safety Review, now scheduled for May 2005.**

Team Members

- Otis Wong, EH&S Office of Assessment and Assurance
- Richard DeBusk, Occupational Safety Group Leader
- Keith Gershon, LLNL EH&S Group 5 Deputy and electrical safety specialist
- Bob Mueller (interface with the Electrical Safety Committee)
- David Allen, DOE BSO Observer

Schedule

- February 15 – March 9, Electrical Safety Committee perform survey of members
- March 8-11, field portion of assessment
- March 11, present preliminary report to support expedited corrective actions
- March 14-18, complete assessment report
- March 18, submit for factual accuracy check and peer review
- March 25, Issue Assessment Report
- April 4-6, DOE-BSO team to validate report and recommend additional corrective actions
- May 16, DOE-SC team to conduct electrical safety review

Assessment Process/Method (1)

- **Reviewed Electrical Safety Committee self-assessment**
- **Interviewed 31 individuals**
  - **6 Electricians**
  - **2 Electronics Technicians**
  - **1 Lighting crew member**
  - **4 Supervisors**
  - **1 Safety Inspector**
  - **1 Electrical Safety Engineer**
  - **2 Senior Managers (88 inch Cyclotron Mgr., D&C Mgr. for Facilities)**
  - **3 Electrical Engineers**
  - **1 Physics Researcher**
  - **2 Safety Coordinator (ALS, AFRD)**
  - **1 Building Manager (Building 5 and 16 in ARFD)**
  - **1 KOO Contractors Project Manager**
  - **2 Pacific Data Electric electrical subcontractor employees**
  - **1 Chair of the Electrical Safety Committee**
  - **1 Molecular Foundry Project Manager**
  - **2 Construction Superintendents (small project)**

Assessment Process/Method (2)

- Performed 4 work observations (2 at B76 Electrical Shop,1 at Molecular Foundry, and 1 at the JGI)
- Performed walkthrough observations of B88, the Advanced Light Source, JGI, Building 5 and 16.
- Observed the monthly meeting of the LBNL Electrical Safety Committee
- Observed safety meeting at B76 Electrical Shop
- Observed monthly LOTO Training (EHS 256 Course)
- Reviewed program documents, including: training materials, qualification rosters, work planning documents, work orders, etc.

Executive Summary (1)

- **A strong safety culture was evident in personnel who perform electrical work, this includes subcontractors, supervisors and managers.**
- **Programmatic weakness exist in the electrical safety program.**
  - **The Energized Electrical Work Permit now in use is not compliant**
  - **Chapter 8 of Pub 3000, “Electrical Safety” is not compliant with requirements in NFPA 70E and does not reflect actual field practice**

Executive Summary (2)

- **The Electrical Safety Committee has self-identified many of the programmatic weakness and is coordinating corrective actions.**
- **Resources now being applied to improving the electrical safety program and correcting weaknesses are NOT ADEQUATE to address all necessary issues before the DOE SC review in May.**

Noteworthy Practices (1)

- **LBNL has not performed manipulative energized electrical work since the SLAC accident.**
- **The inclusion of hazards, controls, and LOTO steps in MAXIMO work orders is easy for the worker to use and integrates safety directly into work. (Existing MAXIMO program should be updated rapidly to use this capability)**
- **Line Management has ownership of the electrical safety program in the Electrical Safety Committee and is committed to improving the program**
- **The ALS has taken a very proactive approach to electrical safety, especially following the SLAC accident**

Noteworthy Practices (2)

- **The ALS has established good control measures for ensuring scientific work complies with electrical safety program requirements**
  - **Legacy issues still exist (e.g., recent shock event)**
- **The revised energized electrical work policy was communicated directly to employees (face-to-face) by the EH&S Electrical Safety Engineer. These briefings were documented as a briefing and were effective as evidenced by interviews during this assessment.**
- **Electrical workers demonstrated ready acceptance of new electrical safety work practices which is evidence of a strong safety culture.**

Concerns (1)

- **Despite having strong electrical safety work practices, electrical safety events continue which indicates some vulnerabilities may not be understood or controlled adequately.**
  - **Researcher shocked at ALS in February 2005**
  - **Penetration of non-energized conduit in B76 in September 2004**
  - **Violation of LOTO procedures in Building 74 in December 2003**
- **The selection of arc flash PPE is limited.**
- **The Appendix B Energized Electrical Permit does not provide information required by NFPA 70E (only 4 of 11 items provided).**

Concerns (2)

- **Chapter 8 of Pub 3000, "Electrical Safety" is not compliant with programmatic requirements and is inconsistent with field practice.**
  - **The roles and responsibilities are inconsistent with existing practice**
  - **Hazard and risk evaluation procedures are not discussed**
  - **Specific training for qualified workers is not discussed**
  - **There is no requirement for a pre-job briefing**
- **The flow-down of safety requirements and the oversight of construction and service contractors for electrical safety needs improvement.**
  - **Contract specs. did not specifically mention the Laboratory electrical safety procedures**
  - **Subcontractor safety plans/checklists did not specifically mention Laboratory requirements**
  - **Communication mechanisms between the Lab and contractors on electrical safety requirements should be improved, especially for small projects (e.g., bid documents, safety plans and pre-job checklists)**

Concerns (3)

- **The methods used to provide assurance of the effectiveness of the electrical safety program are inadequate (EH&S responsibility).**
  - **Infrequent electrical safety inspections**
  - **Integrated Functional appraisals do not consistently evaluate electrical safety**
  - **Inadequate LOTO reviews (required by OSHA)**
- **Flash boundaries are not uniformly applied as required by NFPA 70E.**
- **The requirements to designate qualified electrical workers varies from supervisor to supervisor. Chapter 8 of Pub 3000 does not provide specific enough criteria to support supervisors.**
  - **Requirement for CPR training was only added in March 2005**

Recommendations

- **We need a comprehensive electrical safety corrective action plan.**
  - **The corrective actions should be approved by senior management to ensure lab-wide buy-in.**
  - **Resources to aggressively implement the corrective actions need to be identified.**